



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 8

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**MAY 04 2010**

Ref: 8P-W-GW

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

Michael F. McHugh  
City of Aurora, Water Department  
15151 E Alameda Pkwy, Ste 3600  
Aurora, CO 80012

RE: Response to Comments  
EPA UIC Area Permit CO12143-00000  
ECCV Class I Non-hazardous Area Permit  
Adams County, CO

Mr. McHugh:

Thank you for responding to the Public Notice announcement that was published in the Denver Post and Brighton Standard Blade on February 3, 2010, for the Underground Injection Control (UIC) East Cherry Creek Valley Water and Sanitation (ECCV) Class I Non-hazardous Area Permit in Adams County, Colorado. The extended Public Comment period ended on March 30, 2010. We received two sets of comments from you on the Draft Permit during the Public Notice period. The main concern expressed was potential induced seismic activity as a result of injection. The Statement of Basis has been modified to discuss this concern. Also included with this letter is a copy of the Response to Comments that documents changes to the Final Permit. The Final Permit becomes effective 30 days from the date of issuance, per Title 40 Code of Federal Regulations (40 CFR) Section 124.18 to provide a 30-day window for commenters to appeal the Final Permit decision. The procedures for appealing a Final Permit decision are outlined under 40 CFR Section 124.19, which is enclosed.

St. Louis for

Stephen S. Tuber

Assistant Regional Administrator

Office of Partnerships and Regulatory Assistance

Final UIC Permit

## Statement of Basis

## Response to Comments

Copy of 40 CFR Section 124.18

**East Cherry Creek Valley Water and Sanitation (ECCV)  
Class I Area Permit Response to the Aurora Water Comments  
CO12143-00000**

1. The commenter stated that the public notice found on the EPA Underground Injection Control (UIC) program's website was inadequate public notice due to the lack of a publication date or comment period deadline and requested a permit extension.

EPA response:

The requirements for public notice of permit actions and public comment period found in 40CFR 124.10 were met. The public announcement published in the Brighton Blade and Denver Post stated that the public comment period would end 30 days from the date of its publication and directed the reader to the UIC program's website. However, the lack of a publication date in the public notice found on the website may be unclear when the 30 day expires if the reader reaches the public notice without the benefit of seeing the public announcement published in the papers. EPA has extended the public comment period for 2 weeks from March 17, 2010. This will give Mike McHugh, Permitting Coordinator with the Aurora Water, at least 30 days from the time when he was made aware of the ECCV draft permit to provide additional comments.

2. The commenter expressed concerns regarding the potential for induced earthquakes as a result of deep injection disposal activity proposed by ECCV. The commenter also requested the faults that are identified in Robert Weimer's Guide to the Petroleum Geology and Laramide Orogeny to be reviewed.

EPA response:

In Colorado, there have been a handful of injection activities cited to have induced earthquakes. The most well known is the Rocky Mountain Arsenal (RMA) where, in the early 60's, deep well injection occurred into the Precambrian crystalline bedrock, at a depth of 12,045 feet. The high pressure injection, 1450 psi greater than the formation pressure of 3900 psi, induced earthquakes as high as a magnitude 5. Prior to injection, faults were not known to have existed.

In the Enhanced Oil Recovery Rangely Field, there were known faults that ran through the field, in addition to two major faults running parallel to the field. An experiment was conducted to determine if earthquakes could be controlled. The findings showed that by dropping the pore pressure below a critical value of 3770 psi, the seismic activity would stop, but would start again once pressure exceeded this threshold.

The Paradox Valley Unit (PVU) is a 15,000 feet injection well injecting about 1,500 psi above formation fracture pressure. Seismic activity resulted from injection due to well documented faults in the area. To reduce the stress on the formation, biannual 20-day shut-downs were instituted to allow time for the injectate to make its way into the pores and small fractures.

In each of the events described above, the induced seismic event required a fault(s) and sufficient pore pressure to change the tectonic stress field.

Evidence of Faults

U.S. Geological Survey (USGS) tracks Quaternary faults and folds, which are sources of the magnitude greater than six (6) earthquakes during the Quaternary (the past 1.6 million years), because this period of geologic time is most relevant for studies of active earthquake faults

(<http://earthquake.usgs.gov/hazards/qfaults>). Their database shows that the closest faults/folds are located west of the area permit closer to the Foothills. The closest three are listed below and are approximately 26 miles away:

Fault Number	Fault Name	Slip rate mm/yr
<u>2325</u>	Valmont fault (Class B)	<0.2
<u>2338</u>	Rock Creek fault (Class B)	<0.2
<u>2339</u>	Walnut Creek fault (Class B)	<0.2

There is a series of five documented wrench faults in the vicinity of the area permit that influence present-day reservoir production in the shallower D and Muddy (J) Sandstone in the Wattenberg oil and gas field. The proposed ECCV wells lies on a block between two of these faults, the Lafayette Wrench Fault Zone (LWFZ), and the Cherry Gulch Wrench Fault Zone (CCWFZ). Based on maps in Robert Weimer's Guide to the Petroleum Geology and Laramide Orogeny, the ECCV area permit is approximately 1 mile to 1.5 miles away from the LWFZ and approximately 8 miles from the CCWFZ. Within the area of the 5 wrench faults, there are at least 50 oil and gas disposal and enhanced recovery wells injecting into the D and Muddy (J) sands and lower formations. Present day practices have not triggered seismic activity.

Between the major wrench faults, numerous minor faults are identified or hypothesized to exist, though their exact location is frequently difficult to define. Much of the faulting exhibited in and below the J sand is seen to terminate at the base of the Pierre Shale. Some of these lesser faults may be high angle faults, but many are listric faults, or tensional faults whose angle of dip decreases with depth and may not be tied into the basement structure. This is the nature of many of the faults in the Terry Sandstone. There are other minor synthetic and antithetic faults that have been identified in the J Sandstone which may have origins in the basement and lie within a half-mile of the permit area boundary. Present field experience has shown that injection into these minor faults has not resulted in seismic activity.

Based on the body of literature and data available, there are no known major faults within the permit area of review, however there is the possibility of minor faults. After the well has been drilled, additional information may be gained regarding localized faults.

#### Stress and Pore Pressure Necessary to Induce an Earthquake

The shear stress required to trigger a fault is a function of formation pore pressure. A sufficient increase in pore pressure must exist to reduce the shear stress in the rock to cause failure. To know a priori the pressure that will cause failure, is a formidable task that involves installing a seismic network and flow modeling.

The strongest evidence to date that exists to support the statement that injection is low risk is the current UIC well injection activity in the Wattenberg and Greeley fields through which the five major wrench faults are located. There are nine (9) salt water disposal wells, eight (8) enhanced recovery wells, and one Class I injection well that are injecting into the Lyons formation and deeper. To date, there has not been any reported seismic activity as a result of these injection activities. Their distance from the ECCV injection well ranges from approximately 9 to 45 miles (See Table 1). Review of the maximum allowable injection pressure and injection history shows

that the wells have been authorized to inject up to 3700 psi. However, except for one well, the actual maximum pressure injected has been below 2500 psi.

The closest well to ECCV is the Suckla Farm Class I Non-hazardous disposal well, permit number CO10938-02115. Since 1992, this well has been injecting into the Lyons at a depth of 9280 feet to 9420 feet. The permit maximum allowable injection pressure (MAIP) is 3700 psi, but the well has been injecting below 1000 psi.

**Injection Wells that have injected into the LYONS formation and below**

WELL DESCRIPTION	LOCATION	WELL INFORMATION			ATI	MAIP	Max Inj	Jan/10 Inj
DISPOSAL WELLS		TD	Formation	Status				
EPA Class I, Suckla	1N-67W		LYNS		1992	3700	950	900
05-123-16804, CONQUEST SWD 1-8	4N -64W	9263	ENRD	SI	12/7/07	2130	2150	0
		9263	LYNS	AB	1/99*	3200	2250	0
05-123-23038, SWD 1-8A	4N -64W	9000	LYNS	IJ				
05-123-19688, GERALDINE 32-1	4N -65W	9385	LYNS	IJ	10/3/08	3500	3300	2700
05-123-12448, LYSTER 8-26EG-WD	6N -65W	9765	LYNS	IJ	10/04*	2020	1850	1625
05-123-25694, APOLLO 15-18 I	6N -63W	8675	LYNS	IJ	11/4/08	1426	0	0
05-123-26604, JOHNSON 22-34I	6N -65W	9100	LYNS	IJ	2/20/08	1389	0	0
05-123-05444, BAIAMONTE 1	7N -66W	8992	LYNS	IJ	1/99*	3000	2500	0
05-123-05471, UPRR 6	8N -66W	9259	LYNS	IJ	2/99*	3020	2400	1600
05-123-05463, UPRR 2	8N -66W	9059	LYNS	IJ	4/3/07	3050	0	0
EOR WELLS								
05-123-05444, BAIAMONTE 1	7N -66W	8992	LYNS	IJ	1/99*	3000	2500	0
05-123-05471, UPRR 6	8N -66W	9259	LYNS	IJ	2/99*	3020	2400	1600
05-123-05463, UPRR 2	8N -66W	9059	LYNS	IJ	4/3/07	3050	0	0
05-123-05531, ANDRE 2	8N -66W	9300	LYNS	IJ	1/99*	2900	1700	1300
05-123-05541, UPRR TROY JONES 1	8N -66W	9270	LYNS	IJ	1/99*	2900	1750	150
05-123-07011, PIERCE UNIT 1	8N -66W	9295	LYNS	PA	2/99*	2900	1700	0
05-123-05502, WALKER 1	8N -66W	9291	LYNS	IJ	2/99*	2900	2250	0
05-123-05503, KENNEDY 1	8N -66W	9268	LYNS	IJ	4/00*	2900	2200	1800

\*first reported injection

Table 1

**Conclusion**

Based on existing information, there are no known major faults within the boundary of the area of review. Additional geologic information will be obtained when the well is drilled. ECCV has a large stake in preventing and mitigating seismic activity. In addition to the proposed injection well and reverse osmosis (RO) treatment plant, their Bebe Draw drinking water supply well field is also scattered throughout their UIC permit area.

ECCV has been authorized to inject up to 3120 psi, but the final determination of the MAIP is subject to the results of the step-rate test that will be conducted once the well is constructed to determine the local formation fracture pressure. The injection pressures at other wells in the area indicate that it is probable that ECCV will be operating at a pressure lower than the MAIP. Other operators have been authorized MAIPs up to 3700 psi. With the exception of one

operator, the injection pressure usually topped out at 2500 psi, and generally operating at an even lower pressure.

An additional permit requirement has been included in the permit. If there is a reported seismic event that has been verified by the USGS Earthquake Hazard Program, ECCV will cease injection. According to the USGS, the closest station is in Idaho Springs. At a magnitude ~2, seismic activity will be picked up by the USGS Advanced National Seismic System network and at ~2.5, the location can be determined. USGS has the ability to readily determine the location a magnitude 3 and above. At a magnitude 2.5-3, there is low risk of structural damage.

Once ECCV has received a report of a seismic event, they will report the event to EPA within 24 hours and investigate. ECCV will immediately check if the seismic event has been verified by the USGS Earthquake Hazard Program via their real time earthquake monitoring program that is readily available at <http://earthquake.usgs.gov/earthquakes/> or personal communication. If a seismic activity is verified within two (2) miles of the ECCV permit area, ECCV will immediately cease injection. Two miles is just beyond the distance of the closest wrench fault.

A reported event is defined as either a citizen complaint or a seismic event recorded by the USGS Earthquake Hazard Program within the 50 mile radius of the ECCV permitted area. The 50 mile extent will capture the majority of the area in the DJ basin, including the Wattenberg Oil and Gas Field that is presently used for oil and gas development. ECCV will check the USGS Earthquake Hazard Program monthly for recorded events and provide a summary in the quarterly report. Although the injection activity that ECCV has proposed is very similar, if not the same as the other disposal injection activities, ECCV has agreed to the additional requirement that has not been placed upon other operators, to alleviate the concern of the commentor and to include added vigilance in their program to protect their investments.

Although not to be implemented as a permit condition, but inherent to ECCV's operation, the injection volume is anticipated to be seasonal. The injected volume is dependent on the water usage. Based on historic water usage rates, the highest volume will occur in the summer and drop to one-third of summer usage in the winter. ECCV may even batch the reverse osmosis brine and shut down injection activity for certain periods of time, rather than continuously injecting. Even if injection does not completely cease, the reduction in pressure will allow the fluids to dissipate in the pore space, alleviating the pressure built up in the formation.

3. The commenter asked: "Is the permit in effect for 10 years from the date of issuance or 10 years from the date of final well construction?"

EPA Response:

The permit is in effect for 10 years from the Effective Date. See page 3 of the draft permit.

4. The commenter asked: "Is there a fourth well that is alternative for ECCV DI-3, or is ECCV DI-3 the alternative location for one of the other two listed wells?"

EPA Response:

The Statement of Basis (SOB) reads, "The locations of all three wells have been provided, including an alternate location for the third well." The three well locations are the locations that will be authorized with the final permit. In the event that ECCV elects to use the alternate

location for their third well, they will need to come in for a minor modification. This alternate location is within the area of review.

5. The commenter provided a correction for the legal description for ECCV DI-1.

EPA Response:

The location of this well is SWSW of Section 1 T1S, R66W, not NESW, and will be corrected in the final permit.

6. The commenter had additional comments regarding the content in the Statement of Basis, mainly requesting greater specificity on the geology.

EPA Response:

The statement of basis is a document to briefly describe the derivation of the conditions of the draft permit and provides background information on the project. It is not meant to provide detailed information about the geology. Additional information on the geology can be found in the permit application. The information that is provided with the permit application is regional information or correlations from nearby wells. A requirement of the permit is to run a series of logs after the well is drilled to get site specific information about the geology. These include Caliper, Porosity, Spontaneous Potential (SP), Gamma and Resistivity logs.

7. The commenter expressed confusion regarding the permitting process.

EPA Response:

The opportunity for public comment occurs at the draft permit stage, which is for 30 days unless an extension is provided. In this case, the period was extended an additional 2 weeks. After this period, the final permit becomes effective 30 days after it is signed to allow any person who filed comments on the draft permit to petition the Environmental Appeals Board to review any condition of the permit decision.

Changes to draft permit:

1. The location of the ECCV DI-1 has been corrected to SWSW of Section 1, T1S, R66W.
2. Permit: added Well Injection and Seismicity
3. SOB: added discussion on injection and seismicity
3. Appendix D: added reporting requirement for seismic events

#### **Title 40 CFR 124.19 Appeal of RCRA, UIC, NPDES, and PSD Permits.**

(a) Within 30 days after a RCRA, UIC, NPDES, or PSD final permit decision (or a decision under 270.29 of this chapter to deny a permit for the active life of a RCRA hazardous waste management facility or unit) has been issued under §124.15 of this part, any person who filed comments on that draft permit or participated in the public hearing may petition the Environmental Appeals Board to review any condition of the permit decision. Persons affected by an NPDES general permit may not file a petition under this section or otherwise challenge the conditions of the general permit in further Agency proceedings. They may, instead, either challenge the general permit in court, or apply for an individual NPDES permit under §122.21 as authorized in §122.28 and then petition the Board for review as provided by this section. As provided in §122.28(b)(3), any interested person may also petition the Director to require an individual NPDES permit for any discharger eligible for authorization to discharge under an NPDES general permit. Any person who failed to file comments or failed to participate in the public hearing on the draft permit may petition for administrative review only to the extent of the changes from the draft to the final permit decision. The 30-day period within which a person may request review under this section begins with the service of notice of the Regional Administrator's action unless a later date is specified in that notice. The petition shall include a statement of the reasons supporting that review, including a demonstration that any issues being raised were raised during the public comment period (including any public hearing) to the extent required by these regulations and when appropriate, a showing that the condition in question is based on:

(1) A finding of fact or conclusion of law which is clearly erroneous, or

(2) An exercise of discretion or an important policy consideration which the Environmental Appeals Board should, in its discretion, review.

(b) The Environmental Appeals Board may also decide on its own initiative to review any condition of any RCRA, UIC, NPDES, or PSD permit decision issued under this part for which review is available under paragraph (a) of this section. The Environmental Appeals Board must act under this paragraph within 30 days of the service date of notice of the Regional Administrator's action.

(c) Within a reasonable time following the filing of the petition for review, the Environmental Appeals Board shall issue an order granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action. Public notice of any grant of review by the Environmental Appeals Board under paragraph (a) or (b) of this section shall be given as provided in §124.10. Public notice shall set forth a briefing schedule for the appeal and shall state that any interested person may file an amicus brief. Notice of denial of review shall be sent only to the person(s) requesting review.

(d) The Regional Administrator, at any time prior to the rendering of a decision under paragraph (c) of this section to grant or deny review of a permit decision, may, upon

notification to the Board and any interested parties, withdraw the permit and prepare a new draft permit under §124.6 addressing the portions so withdrawn. The new draft permit shall proceed through the same process of public comment and opportunity for a public hearing as would apply to any other draft permit subject to this part. Any portions of the permit which are not withdrawn and which are not stayed under §124.16(a) continue to apply.

(e) A petition to the Environmental Appeals Board under paragraph (a) of this section is, under 5 U.S.C. 704, a prerequisite to the seeking of judicial review of the final agency action.

(f)(1) For purposes of judicial review under the appropriate Act, final agency action occurs when a final RCRA, UIC, NPDES, or PSD permit decision is issued by EPA and agency review procedures under this section are exhausted. A final permit decision shall be issued by the Regional Administrator:

- (i) When the Environmental Appeals Board issues notice to the parties that review has been denied;
- (ii) When the Environmental Appeals Board issues a decision on the merits of the appeal and the decision does not include a remand of the proceedings; or
- (iii) Upon the completion of remand proceedings if the proceedings are remanded, unless the Environmental Appeals Board's remand order specifically provides that appeal of the remand decision will be required to exhaust administrative remedies.

(2) Notice of any final agency action regarding a PSD permit shall promptly be published in the Federal Register.

(g) Motions to reconsider a final order shall be filed within ten (10) days after service of the final order. Every such motion must set forth the matters claimed to have been erroneously decided and the nature of the alleged errors. Motions for reconsideration under this provision shall be directed to, and decided by, the Environmental Appeals Board. Motions for reconsideration directed to the administrator, rather than to the Environmental Appeals Board, will not be considered, except in cases that the Environmental Appeals Board has referred to the Administrator pursuant to §124.2 and in which the Administrator has issued the final order. A motion for reconsideration shall not stay the effective date of the final order unless specifically so ordered by the Environmental Appeals Board.

**[48 FR 14264, Apr. 1, 1983, as amended at 54 FR 9607, Mar. 7, 1989; 57 FR 5335, Feb. 13, 1992; 65 FR 30911, May 15, 2000]**